

The southern limits of distribution of commercially important penaeid prawns in South Africa

by

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Seven species of commercially important penaeid prawn are commonly found along parts of the eastern coast of South Africa. Five species are recorded in the commercial catches from the St Lucia lake system (Joubert and Davies 1966) and all seven in Durban Bay (Joubert 1965). Prior to this study five of these species (*Penaeus japonicus* Bate, *P. canaliculatus* Olivier, *P. monodon* Fabricius, *P. indicus* Milne-Edwards and *Metapenaeus monoceros* Fabricius, had been recorded from almost as far south as East London; three (*P. japonicus*, *P. monodon* and *P. indicus*) as far south as the Swartkops River estuary, Algoa Bay, and two species (*P. japonicus* and *P. indicus*) have been recorded as far south and west as Knysna (Day *et al* 1952).

The occurrence of shrimp in these inshore waters at what appears to be the limits of their range raises some interesting questions concerning (i) their origin (in terms of spawning and nursery sites), and (ii) the factors limiting their distribution southwards. It was hoped that a survey of potential nursery areas towards the limits of distribution, together with an examination of records of occurrence in these waters would shed light on these questions.

METHODS

Field sampling was conducted at intervals between early October 1967 and late January 1968. The techniques used were similar to those previously used successfully in Moçambique (Hughes 1966) and in the U.S.A. (Hughes 1969). A "Discovery-type" plankton net (1 metre mouth) was used to sample for both postlarvae and juveniles moving into or away from the estuaries. Sampling was conducted during the day and at night at the entrance to the Swartkops, Keurbooms-Bitou, Piesang and Knysna river estuaries. Flood tides were sampled at all the above-mentioned estuaries and ebb tides at Swartkops and Keurbooms-Bitou river estuaries.

A hand-operated dredge net was used to sample for juveniles within the estuaries. The mouth of the net was semicircular (diameter 3 ft.), and from the mouth a 6-foot-long net (18 mesh/inch, 1 mm aperture size) tapered to a point where the collecting bottle was attached. The base of the net was reinforced with canvas as protection from the substrate. The net was generally pulled by hand, but in the Knysna estuary it was, in addition, towed behind a boat. A variety of shallow-water habitats were sampled in each estuary.

In the Swartkops estuary numerous prawns were collected from the grids protecting the water intake system of the Swartkops power station. This proved to be the best source of material.

A number of sport and bait fishermen were questioned and a survey was made of the literature for any mention of these species. The collections of several museums were examined.

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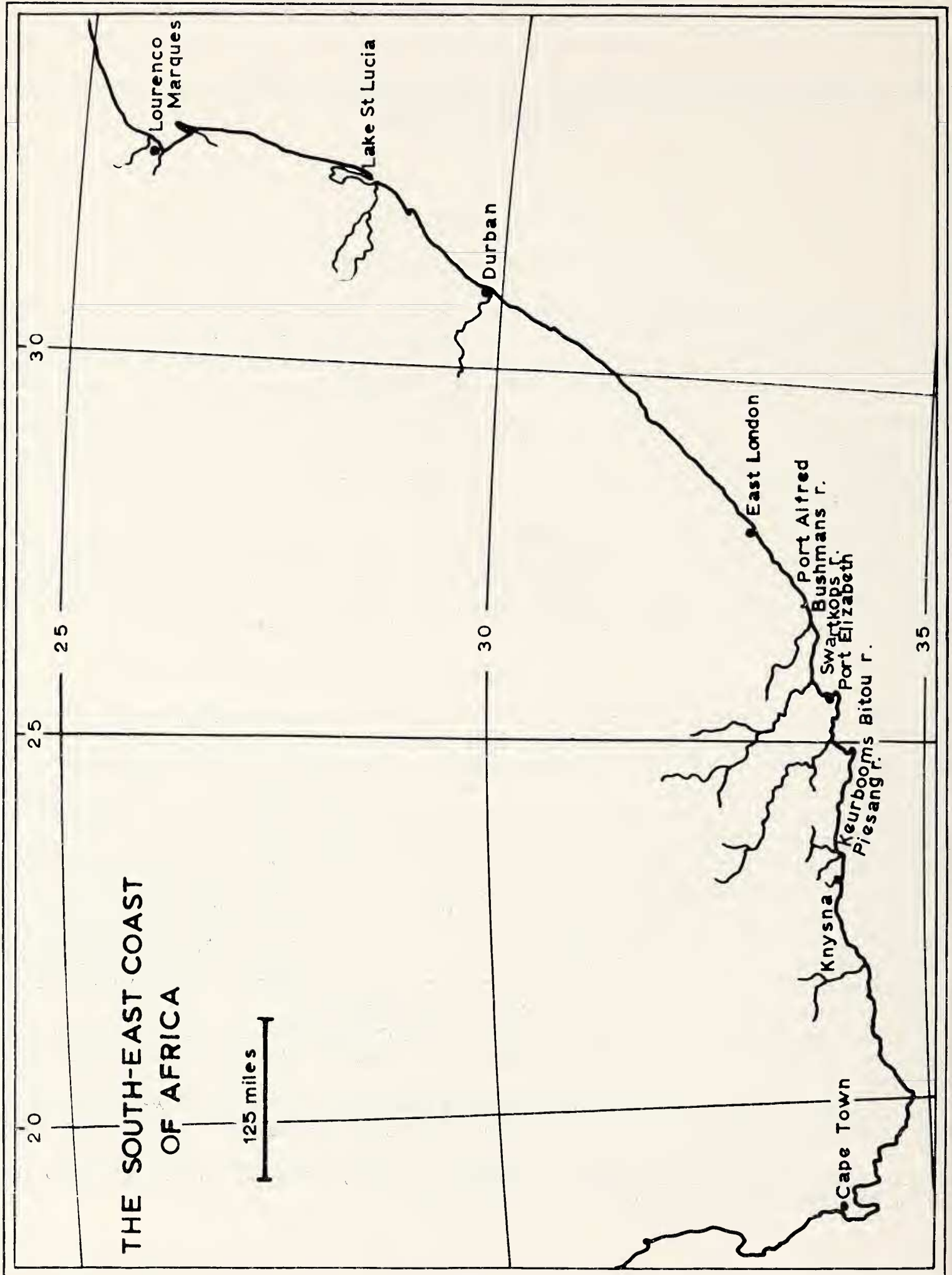


Fig. 1

RESULTS

Sampling. No penaeid prawns were collected in any of the four estuaries using either of the two nets. The sampling techniques employed were similar to those used successfully in comparable situations elsewhere, and the habitats sampled were similar to those in which prawns are usually found. It was therefore assumed that these results were a fair indication of the paucity of both juvenile prawn within these estuaries and of postlarvae entering them.

The following species were taken from the grids of the Swartkops power station:

<i>P. japonicus</i>	6 specimens 11.4—15.0 cm (total length, as measured from the post-orbital margin to the tip of the telson).
<i>P. latisulcatus</i>	2 specimens 12.5 and 13.4 cm.
<i>P. canaliculatus</i>	4 specimens 12.2—14.8 cm.
<i>P. monodon</i>	1 specimen 13.2 cm.
<i>P. indicus</i>	13 specimens 3.0—5.2 cm.

Examination of Museum Material and Records of Occurrence. Very few penaeid prawns from eastern Cape waters were available in museum collections. A few were present in the collections of the Albany and Port Elizabeth museums. The Durban museum had none, while the South African Museum had acquired no further penaeid material since the publication of Dr Barnard's (1950) catalogue of the decapod crustacea of South Africa.

Of the prawns examined a number which had been labelled *P. japonicus* were clearly *P. latisulcatus* and *P. canaliculatus*. Only *P. latisulcatus* from Port Alfred extended farther southward than previously known distribution records. It had previously only been recorded from Durban (Joubert 1965). Of the museum material examined the smallest specimen was an individual of *P. monodon* (11.0 cm) and the largest was a ♀ of the same species from the Swartkops estuary (19.5 cm). The significance of this is mentioned in the discussion.

In their report of an ecological survey of the Knysna estuary, Day *et al* (1952) record finding *P. indicus* and *P. japonicus*. They give no indication of the size of these prawns. This represents the most westerly record of distribution of a commercially important penaeid along the South African coast.

As it has been shown (Hughes 1966) that juvenile prawns are most abundant in the shallow fringes of the water of "nursery areas", it is noteworthy that Macnae (1957) does not record the presence of any penaeids in his survey of the Swartkops estuary, despite the fact that his study was limited to the intertidal zone.

Van Wyk (personal communication and a series of papers in the *Annual Reports of the Department of Nature Conservation*) examined numerous estuaries along the east coast of South Africa. He records no penaeids south of the Bushmans River.

Interviews of Fishermen. A number of sport and bait fishermen operating on the Swartkops River were questioned concerning the seasonal occurrence, abundance and size of "swimming prawns". The information was consistent in so far as all stated that the prawns "came into" the estuaries in late summer, March and April being particularly mentioned; that they were in these months most readily available to dipnetters at night, and that it was sometimes possible to accumulate a bucket or more of them. These were described as being usually about 12 cm in length. Although individuals half this size were mentioned it was not always possible to know whether these smaller individuals were in fact penaeids or the palaemonid, *Palaemon pacificus* which are most abundant.

DISCUSSION

Several noteworthy points emerge from the results. With the exception of *P. indicus* (3.0—5.2 cm) the size of the prawns collected within these estuaries is invariably greater than the maximum size of penaeid prawns occurring in inshore waters elsewhere. Tabb (1962) records a maximum carapace length of 3.2 cm for *P. duorarum* in Florida, and Hughes (unpublished) only exceptionally found individuals greater than 9.5 cm (total length) in "nursery areas" in Moçambique.

No postlarvae and virtually no small juvenile shrimp were found or have been recorded within these estuaries. If the shrimp caught by fishermen in March and April were reared within these estuaries one would expect, at the time of this sampling, to have encountered fair numbers of juveniles. From this one must conclude that to explain the nature of the occurrence of penaeid shrimp in these waters it is necessary to postulate that these adults (or sub-adults) are spawned and reared farther north and subsequently move down the coast into the southern estuaries. Macnae (1962) has pointed out the possible role played by the current systems off the eastern coasts of South Africa in effecting the distribution of marine species. He points out that the south-westerly flowing Moçambique-Agulhas current which flows strongly along the edge of the continental shelf may transport southwards the larval forms of warm water species not normally found there. He specifically mentions the larvae of penaeids. It is probably true, as the presence of juvenile *P. indicus* suggests that shrimp larvae are washed south but from the evidence available it appears that this current brings with it adults and sub-adults, which have probably already left their more northern nursery areas, as well as larval stages.

The intervening waters between the Moçambique-Agulhas current and the coast are much colder than the Moçambique-Agulhas current itself. Macnae (1962) suggests that this barrier is overcome when the influence of the trade winds sets up eddy systems along the margins of the current, bringing the warm water closer inshore. However as one moves southwards down the coast of South Africa the width of the continental shelf increases until off Knysna it is approximately 60 miles wide. The greater width of the intervening colder waters westward from Knysna may be the principal cause of the decrease in numbers of prawns found within estuaries south-west of Port Elizabeth and may be the barrier to their colonization of estuaries west of Knysna.

It is therefore probable that the presence of almost all penaeid prawn species in the waters of the eastern Cape can be accounted for in terms of their transport southwards either immediately after spawning (as in the case of *P. indicus* of this survey) or at later stages as sub-adults or adults. The absence of postlarval prawns and the paucity of juveniles, found during the investigation, gives further support to Macnae's (1962) contention that penaeid stocks along most of the southern part of the African coast are not self-perpetuating, but rely entirely on replenishment by southward moving individuals, spawned farther north.

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